OBJECT TRACKING

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. patent application Ser. No. 13/569,003, filed on Aug. 7, 2012, and titled "OBJECT TRACKING," the entire disclosure of which is hereby incorporated herein by reference.

BACKGROUND

[0002] The tracking of the location or other state of objects may occupy a significant amount of effort in everyday life. Further, much time may be spent in trying to locate misplaced objects. For example, searching for misplaced car keys, wallets, mobile devices, and the like may cause people to lose productive time. Likewise, forgetting that the milk carton in the home refrigerator is almost empty may lead to an extra trip to the store that could have been avoided had the shopper remembered the state of the milk carton. In some instances, such objects may be moved, emptied, etc. by a person other than the owner, thereby complicating the task of tracking.

SUMMARY

[0003] Accordingly, various embodiments are disclosed herein that relate to the automatic tracking of objects. For example, one disclosed embodiment provides a method of operating a mobile computing device that comprises an image sensor. The method includes acquiring image data, identifying an inanimate moveable object in the image data, determining whether the inanimate moveable object is a tracked object, and if the inanimate moveable object is a tracked object, then storing information regarding a state of the inanimate moveable object. The method further comprises detecting a trigger to provide a notification of the state of the inanimate moveable object, and providing an output of the notification of the state of the inanimate moveable object.

[0004] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter. Furthermore, the claimed subject matter is not limited to implementations that solve any or all disadvantages noted in any part of this disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1A depicts a user of an embodiment of a see-through display device viewing a use environment through the see-through display device.

[0006] FIG. 1B shows a perspective of the user of FIG. 1A, and also shows an embodiment of a tracked object alert displayed on the see-through display device.

[0007] FIG. 2 shows another embodiment of a tracked object alert displayed on the see-through display device.

[0008] FIG. 3 shows a block diagram of an embodiment of a use environment for a see-through display device configured to track objects.

[0009] FIG. 4 shows a flow diagram depicting an embodiment for tracking objects via a see-through display device.

[0010] FIG. 5 shows a block diagram depicting an embodiment of a computing device.

DETAILED DESCRIPTION

[0011] As mentioned above, tracking and remembering the states (e.g. location or other physical state) of objects may take significant time in effort during everyday life. Further, failure to accurately track the states of objects may lead to lost time and productivity. Therefore, embodiments are disclosed herein that relate to automatically tracking the states of objects. Briefly, a mobile device, such as a see-through display worn by a user, may comprise image sensors that observe the user's environment. Video data from the image sensors may be processed to detect objects in the user's environment, and to identify tracked objects in the video data. State information, such as location and other characteristics, of tracked objects may then be stored. This may allow for the output of an alert regarding the state of a tracked object upon detection of an alert trigger, such as a user request or a contextual clue. The state information may be stored locally, and/or uploaded to a remote service. Where multiple people utilize object-tracking devices as disclosed herein, each person may become aware of changes to objects made by other users via the sharing of object tracking information. In this manner, a user may be able to discover a most recent location of lost keys, may be provided with a reminder to buy more milk while browsing the dairy section at a grocery store, and/or may track and recall other object state information in any suitable manner.

[0012] FIGS. 1A and 1B illustrate a non-limiting example use scenario. First, FIG. 1A illustrates a user wearing a head-mounted see-through display device 100 in the form of a pair of glasses, and observing an environment (a living room) through the see-through display device 100 at a first time t_1. As described in more detail below, the see-through display device 100 comprises one or more outwardly facing image sensors (RGB and/or depth sensors) that acquire video imagery as the user moves about. The acquired video imagery may be analyzed, in real time or at a later time, to identify moveable inanimate objects that are tracked by the user, as described in more detail below. In FIG. 1A, an example embodiment of a tracked moveable inanimate object is illustrated as keys 102 that are located on a table under a pile of magazines, but it will be understood that any suitable object may be tracked.

[0013] The identified object data and/or image data may be stored to provide future information, such as alerts, to the user regarding the objects. For example, referring to FIG. 1B, at a later time t_2, the keys 102 have been covered by a newspaper 104. Thus, in response to a user input requesting information about the location of the keys (e.g. a voice command detected via a microphone on the see-through display device 100), the keys are highlighted 106 on the see-through display device 100.

[0014] It will be understood that the see-through display device 100 may not track state information for all objects that a user observes or even interacts with. For example, in FIG. 1A, the environment observed by the user includes various other moveable inanimate objects than keys 102, such as magazines 108, a flower pot 110, and books 112 on a bookshelf, that the user may not wish to track.

[0015] As such, the see-through display device 100 may track the state of objects that are considered sufficiently "important," wherein the term "important" signifies whether